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**"Stinger Under Armor": An Analysis of Alternatives**

**A Monograph  
by**

**Major Alan D. Landry  
Air Defense Artillery**

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Similarly, in recognition of the growing influence of force development considerations in the overall acceptability of any strategy, a second set of criteria, based on the factors of "cost," "availability," "feasibility," "risk," and "modernization impacts" are also considered.

While the analysis uses numerical ratings for each employment option, the numbers simply provide a useful means for the comparison of strategies. They are subjective, and open to challenge. However, of greater importance is the relative ranking of alternative strategies based on these two categories of effectiveness, and that ranking is less volatile.

The analysis identifies clear benefits of providing dedicated carriers for Stingers. It also identifies the inferiority of non-dedicated Stinger and of the use of non-dedicated maneuver unit vehicles to carry Stinger teams during offensive operations in mid-to-high intensity environments.

Finally, the study draws the reader to question the broader implications of the materiel acquisition and combat development processes that have contributed to creating a window of vulnerability in forward area air defense in the pre-FAADS era. This broader deficiency ultimately drove the need for "Stinger Under Armor" as a short-term solution to a current battlefield vulnerability.

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## ABSTRACT

### "STINGER UNDER ARMOR": AN ANALYSIS OF ALTERNATIVES by Major Alan D. Landry, USA, 52 pages.

This monograph examines a concept for the employment of the Stinger Air Defense Artillery weapon system known as "Stinger Under Armor." It traces the evolution of the concept from its genesis during the SGT York Division Air Defense Gun testing period to the present, highlighting the many variants the term has come to embrace as well as the changing context in which the Stinger has been employed. The monograph is analytical in nature, but stresses subjective and relational considerations rather than objective criteria which lie beyond the means of this project. Instead, it provides a broader conceptual framework to analyze primary employment alternatives and establish relative values for the overall effectiveness of each strategy.

Historical imperatives relating to the employment of air defense weapons in defense of ground maneuver units derived from past conflicts provide a logical, cohesive framework for the analysis. Time tested principles of "mass," "mix," "mobility," and "integration" are combined with essential battlefield tasks of "shoot," "move," and "communicate" to build an evaluation matrix of "Combat Criteria."

Similarly, in recognition of the growing influence of force development considerations in the overall acceptability of any strategy, a second set of criteria, based on the factors of "cost," "availability," "feasibility," "risk," and "modernization impacts" are also considered.

While the analysis uses numerical ratings for each employment strategy, the numbers simply provide a useful means for comparison of strategies - they are subjective, and open to challenge. However, of greater importance is the relative ranking of alternative strategies based on these two categories of effectiveness, and that ranking is less volatile.

The analysis identifies clear benefits of providing dedicated carriers for Stingers. It also establishes the inferiority of non-dedicated Stingers, and of the use of non-dedicated maneuver unit vehicles to carry Stinger teams during offensive operations in mid-to-high intensity environments.

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## CHAPTER 1

### Introduction, Problem Statement, Methodology

For war is the great auditor of institutions

- Correlli Barnett<sup>1</sup>

This study is about a concept known as "Stinger Under Armor." It is also concerned with how the Army identifies, and acts on, vulnerabilities identified by units in the field. The specific concept, developed fully in later chapters, is conceptually simple. Stinger, the short-range man-portable air defense system (MANPADS) organic to the heavy division Air Defense Artillery Battalion, is removed from its organic wheeled vehicle and placed, with one crew member, on an armored track. The rationale for the practice concerns tradeoffs between survivability and mission accomplishment. The organic wheeled vehicle of the Stinger team has repeatedly demonstrated the lack of mobility and survivability required to support offensive operations in the mid-to-high intensity environment replicated at the Army's premier training facility, the National Training Center (NTC) at Ft. Irwin, California. Over time, units experiencing unsatisfactory results at the NTC developed local solutions to the problem of Stinger survivability. While these approaches were dissimilar in important aspects, many were subsumed by the tactical concept of "Stinger Under Armor." This would suggest that confusion about the term, as well as lack of consensus about its effectiveness, exist - that is indeed the case. This study examines a number of these options to include the U.S. Army Air Defense Artillery School's doctrinal and materiel responses to the growing demands from the field to "fix the problem." Along the way, the study attempts to shed some light on the very complex subject of how our Army perceives the need to produce change to correct untenable deficiencies, and how it goes about that process.

### RESEARCH METHODOLOGY

Approved Army doctrine provides the foundation for assessing the effectiveness of the various Stinger employment options in terms of basic AirLand Battle requirements. ADA doctrinal publications establish Air Defense

doctrine for the employment of Stinger in support of AirLand Battle (ALB) operations. This doctrinal foundation provides certain requirements useful in analyzing various Stinger employment strategies. Basic force development considerations provide a second set of criteria useful to examining alternative strategies. Together, the doctrinally-derived combat and force development criteria furnish a basis for comparative assessment of the Stinger employment strategies. Historical Imperatives for air defense operations extracted from the lessons of past and recent conflicts will frame the analysis and provide context for assessing my conclusions, and deriving your own. Finally, observations from the National Training Center, the U.S. Army Air Defense Artillery School, and various field agencies support the assessments and provide another check on the analysis.

### BASIC CONSIDERATIONS

Most air defense analyses are replete with data generated from sophisticated computer simulations and models which justify the acquisition of new systems. Although this study does direct some serious questions toward the Army's combat development community, it is not an attempt to justify the purchase of a new system. That act is currently being played out by the best and brightest as the Army (and the ADA community in particular) works to insulate sorely needed funds for the Forward Area Air Defense System (known as FAADS) from current and anticipated defense budget cuts. While this analysis recognizes the links between current systems and FAADS, its focus is on how to fix and use air defense systems on hand today.

This is not an air defender's monograph solely for air defense consumption. The problem is larger than that. Currently, the Air Defense community is sensitive about materiel acquisition issues out of concern that the critical Forward Area Air Defense System (FAADS) will be placed at risk. There is good reason for the concern. The need for FAADS - not just in the ADA world, but in the Army at large - is great. But as competition among all Branches of the Army and among the Services for their "fair share" of the ever-shrinking defense budget pie has heated up, expensive programs are at ever-increasing risk. And FAADS is expensive. It is also the solution for the current deficiencies in air defense of the forward area.

That said, the "Stinger Under Armor" issue needs to be examined in detail. FAADS is not fielded, and there is great divergence between the field and the



TRADOC communities over how to fight Stinger as currently configured. This study will provide ample reason for soldiers of all schools of thought to consider the risks of operating without freedom to maneuver on the modern battlefield, regardless of how that freedom is lost.

The study provides a forum to challenge us to think about the way we are using existing systems, to consider how we arrived at the state we are in today, and to see current air defense vulnerabilities in a more cohesive picture. As its focus is different from traditional air defense studies, so too is its methodology. Combat factors used in this analysis are: shoot (includes detect, acquire, identify, engage, and destroy); move; communicate; survive; and sustain. These factors are derived from doctrinal requirements. They are capabilities indicated by the AirLand Battle dynamics of combat power (maneuver, firepower, protection, and leadership).<sup>2</sup> Moreover, they are the specified "Tasks of Execution" detailed in the capstone ADA doctrinal manual (FM 44-100, U.S. Army Air Defense Artillery Operations) as essential to providing air defense protection to supported forces.<sup>3</sup>

Yet today, perhaps as never before, other factors are as consequential in evaluating alternative strategies. These considerations flow from the force development process, and include such significant items as cost, availability, feasibility (risk), and impact on other modernization programs. Given current budgetary and threat realities, neither combat nor force development considerations alone can justify a strategy. Together, they provide a more realistic framework for resolving the critical problem of providing air defense to heavy maneuver forces in offensive operations in the pre-FAADS period.

#### IMPORTANCE AND RELEVANCE OF THE QUESTION

"Stinger Under Armor" cannot be understood outside of the context of the Army's search for a solution to active air defense protection for the heavy division in the period 1970-1990. The Secretary of Defense's 1985 cancellation of the SGT York Air Defense Gun dealt a serious blow to the Army Air Defense community's plan to correct serious materiel deficiencies for air defense of divisional forces in the forward area.<sup>4</sup> Long an area of insignificant Army resourcing, forward area air defense drew increasing attention during the 1970-1980 period with the recognition of rapidly-growing Soviet air capabilities. In particular, Soviet attention to, and resourcing of, a family of heavily-armed antitank helicopters highlighted the problem of inadequate

active air defenses for the division. Threat community projections of the ability of future Soviet helicopters to hover and engage at stand-off ranges doomed the expensive and problem-riddled SGT York program. Yet with that cancellation, the Department of Defense further widened the serious vulnerability gap between US maneuver force air defense capabilities and the air threats targeted against them.<sup>5</sup>

In recognition of the seriousness of the problem, the Secretary of Defense directed a thorough combined arms audit of forward area air defense threats and capabilities. This priority study resulted in the his 1986 approval of the FAADS Program.<sup>6</sup> Far more than a substitute for the SGT York, FAADS represented long overdue recognition by the Defense community that air defense of divisional forces was, and remains, a serious deficiency warranting priority resourcing. From the SGT York test, the Defense community learned that "one weapon alone, or even multiple weapons acting independently, cannot defeat the air threat."<sup>7</sup> FAADS is consequently based on a "system of systems" which integrates five complementary components: a Line-of-Sight Forward (LOS-F) (Heavy) system; a Line-of-Sight Rear (LOS-R) system; a Non-Line-of-Sight (NLOS) system; an ADA C3I System; and a Combined Arms Initiative (CAI) element by which non-ADA battlefield systems gain enhanced anti-air capabilities.<sup>8</sup>

Without question, the ultimate solution to air defense of the forward division area is FAADS.<sup>9</sup> This study does not attempt to presume, modify, or suggest alternatives to the thoroughly analyzed, carefully constructed FAADS architecture. That is the system the Army needs. However, consecutive budget reductions have caught the FAADS Program in mid-stream and threaten its timely completion.<sup>10</sup> Ironically, the most vulnerable component of FAADS at this time appears to be the Air-Defense Antitank System (ADATS), the component to be deployed in the most forward area of the division (LOS-F-H), and the component most needed to fill the divisional air defense void.<sup>11</sup>

It is useful here to recall that at the time the SGT York was undergoing developmental and operational testing, the heavy division's ADA battalion consisted of 2 batteries of 12 Chaparrals and 18 Stingers each, and two batteries of 12 Vulcans and 18 Stingers each - a total of 24 self-propelled guns, 24 self propelled missiles, and 72 Stinger teams with organic transportation.<sup>12</sup> The Army of Excellence (AOE) reorganization directed by the Chief of Staff (CSA) significantly reduced the number of dedicated and fielded ADA systems. It consolidated divisional Chaparral air defense systems at

corps level, and restructured the remaining ADA assets into a battalion consisting of 1 Stinger Battery (36 Stinger Teams) and three Vulcan/Stinger Batteries (3 Vulcans/12 Stinger Teams).<sup>13</sup> In sum, the reorganization reduced dedicated divisional ADA systems by approximately 24 self-propelled missile systems while reducing ADA personnel strength from 838 to 658.

During this same period, the Soviet Union engaged in an unprecedented expansion and modernization of their air forces. The change was most significant in the increased number and capabilities of their helicopter fleet. In 1972, for example, the Soviet Union lacked the capability to conduct antiarmor operations with helicopters.<sup>14</sup> By 1975, they reportedly had approximately 200 Hind and Hip helicopters gunships with antiarmor capabilities. By 1985, the number had increased to approximately 1300 including heavily armed and armored variants of the Hind and a smaller number of the more capable Havoc. While the total number of fixed wing aircraft in the Soviet inventory remained relatively constant at approximately 2600 fighters and ground attack aircraft during this period, the Soviets did introduce the Frogfoot (similar to the U.S. A-10) specifically designed for antiarmor operations.<sup>15</sup>

The obvious implication is that if U.S. heavy divisions were forced to fight the Soviets today, they would fight against a dramatically improved threat with significantly fewer active air defense systems protecting them than they had 10 years ago. This is clearly an environment that increasingly threatens to deny the ground commander freedom to maneuver. The implications for divisional air defenders are significant. Every ADA weapon system on the battlefield must be used to maximum advantage. Misuse, misallocation, or misemployment of the remaining active air defense systems could well signal the defeat of supported forces in a mid-to-high intensity offensive environment.

In recognition of these realities, both maneuver and ADA units have sought work-arounds since these deficiencies began to surface at the National Training Center. One such work around is the Stinger-Under-Armor concept. This study considers this and alternative strategies which seek to minimize the vulnerabilities of the Stinger while maximizing its capabilities to protect the divisional force. Should FAADS fielding continue to be stretched out, these options may be the only ones available should war break out. As such, they should be carefully analyzed in peacetime to ensure that such analysis is not required in the crucible of combat.

## ASSUMPTIONS

Assumptions frame and limit this study. The problem of air defense in the division's forward area consumed the time and talents of some of the Army's best combined arms analysts for over a year during the FAADS study. This monograph does not question that study or its findings. To the contrary, it attempts to address what will undoubtedly be a major shortfall in the ability of US heavy divisions to operate effectively on the battlefield if FAADS is not fielded prior to conflict. It is also assumed, however, that defense budget reductions will continue to increase pressure to stretch out, modify, or perhaps even abandon elements of the FAADS Program. It is the view of this author that any of these moves would seriously jeopardize the ability of US divisions to execute AirLand Battle Doctrine and would likely be an unrecoverable shortfall; yet the potential is there and must be recognized. The basic assumption, then, is that if war breaks out in the near term (before FAADS is fielded), the Army will be forced to either fight with Stinger as presently configured or find a way to fight it "Under Armor." Although the monograph is analytical, it does not use standard operations research techniques or computer simulations typically used to assess ADA systems. Instead, it offers a doctrinally-based, subjective, comparative matrix to assess current alternatives to making ends meet until FAADS is fielded.

The study assumes that maneuver organizations will remain organized and equipped basically as at present - there will be no major surplus of materiel or equipment for use by air defenders. A mid-to-high intensity offensive environment is used, although implications for defensive operations are apparent. The study also assumes that the NTC will remain the premier training center for heavy forces. Similarly, it assumes the air threat represented by Soviet air platforms will continue to grow as near-term projections suggest -- that is, to incorporate air-to-air and stand-off antitank capabilities for rotary wing aircraft.

## CHAPTER 2

### Background

"Stinger Under Armor" emerged in 1985 as a concept initiated by maneuver units to respond to the inability of Stinger with its organic transportation to survive indirect fires in the heavy division's forward area at the National Training Center.<sup>16</sup> While the term has come to embrace a number of variants, it generally envisions removing the Stinger gunner from his HMMWV and placing him in a non-dedicated armored vehicle to provide enhanced survivability in the forward area. This study examines all major variants and other major alternative strategies to the problem of Stinger survivability and effectiveness in the forward area.

#### AN ADA SHORAD PRE-FAADS PRIMER

To understand the magnitude of the Stinger issue one must first understand where it fits within the total counterair operation of the AirLand Battle. Counterair operations are defined by JCS Pub 3-01.2 as:

Those operations conducted to attain and maintain a desired degree of air superiority by the destruction or neutralization of enemy forces.<sup>17</sup>

Current doctrine distinguishes between three classes of counterair operations: offensive counterair (OCA); defensive counterair (DCA); and suppression of enemy air defenses (SEAD).<sup>18</sup> OCA operations target enemy air forces and supporting infrastructures "as close to the source as possible."<sup>19</sup> On the other hand, DCA operations target "attacking aircraft or missiles, or nullify the effectiveness of their attack."<sup>20</sup> DCA consists of both active and passive measures which contribute to these battlefield tasks. Passive DCA includes such measures as cover, concealment, smoke operations, signature reduction, and deception efforts to inhibit the efforts of threat air. Active DCA is conducted with Army air defense artillery weapons, aviation, artillery, electronic warfare, combined arms, chemical units, and air elements to "disrupt or destroy airborne enemy aircraft, missiles, and other aerial vehicles that pose a threat."<sup>21</sup>

According to the capstone ADA doctrinal manual (FM 44-100, US Army Air Defense Operations), air defense is identified as one of the Army's seven

battlefield operating systems (BOS).<sup>22</sup> Within this BOS, active Army air defense systems are further divided into two categories based on capabilities: high-to-medium altitude air defense (HIMAD) for such weapons as the Patriot and HAWK missile systems; and short-range air defense (SHORAD) for systems such as Chaparral, Vulcan and Stinger.<sup>23</sup> All divisional ADA weapons belong to this last category - the division has no organic high-to-medium altitude ADA capability. Thus, in the total picture of counterair, divisional air defense weapons are a subset of the Army's active air defense DCA capabilities.

As the proponent for the air defense BOS, the Army ADA community has translated its air defense responsibilities into a four-fold mission statement:<sup>24</sup>

- (1) ensure the combined arms team retains the freedom to maneuver.
- (2) protect C2 nodes.
- (3) sustain the battle.
- (4) kill enemy aircraft the first time.

ADA is the Army's only force dedicated to performing this set of missions in the air dimension of the battlefield.<sup>25</sup> Yet, it is important to reflect on the force which is currently charged with these tasks. These are times of transition as the Army awaits the fielding of FAADS. For the heavy division today, this means that the division commander can count on a total of 3 Vulcan/Stinger Batteries and 1 Stinger Battery for dedicated air defense protection of all divisional critical assets - a total of 27 guns and 72 Stinger teams at best.<sup>26</sup> To the brigade commander, this typically means that a maximum of a single composite Vulcan/Stinger battery (9 Vulcans and 12-15 Stinger teams) will generally be available to protect the brigade's critical assets. This assumes an equitable distribution of ADA systems throughout the division's forward area with limited consideration for assets in the division rear area.

Even so, the distribution of so few active air defense assets within the brigade area brings into serious question the oft-heard, generally misleading concept of SHORAD "umbrellas" covering the maneuver forces. Such "umbrellas," if they exist in the forward area at all, are likely to be fleeting in nature and distributed across a few small areas rather than providing large "area" coverage over a maneuver force. This is an unavoidable consequence of the serious range limitations of the currently fielded ADA weapons, their vulnerability to direct and indirect fires, the limited quantities of these

systems, the numerous brigade assets vulnerable to air attack, and basic ADA employment guidelines and principles. To gain a better appreciation for current SHORAD coverage, it is worthwhile to consider the characteristics of the two systems fielded today in the forward area.

The Vulcan is a 1960s-vintage 20mm cannon mounted in a modified M113 carrier.<sup>27</sup> Its maximum effective range is approximately 1200 meters, although in the past year, a product improved Vulcan (PIVADS) has been fielded which reportedly increases maximum effective range to 2600 meters.<sup>28</sup> While every capability improvement to the Vulcan helps, the gap between capability and need remains very large. In fact, the SGT York system was canceled in large part because it could not effectively engage beyond 6 km, over twice the effective range of PIVADS.<sup>29</sup> Furthermore, the Vulcan lacks the mobility of the modernized mechanized and armored units it supports.<sup>30</sup> It is also limited by severely degraded accuracy when firing on the move, ammunition resupply problems due to high rates of fire (1000, 3000 rounds per minute), requirements for visual acquisition of aircraft, and lack of adequate armor protection for crews and materiel.<sup>31</sup> Mutual support distance is 1000 meters - that is the maximum distance fire units should be separated for one fire unit to be able to fire into the dead zone of an adjacent unit.<sup>32</sup> The total number of assets which the Vulcans can protect is limited, therefore, by important employment guidelines which the commander violates only at great risk to the Vulcan systems and the assets they protect.<sup>33</sup> In this regard, Vulcans are designed to be employed at least in pairs, and ADA doctrine questions their employment in any strength below platoon size (3-4 systems) per protected asset.<sup>34</sup> Thus, the total number of assets which can be protected realistically by a battery of Vulcans is between 3-5.

The Vulcan is seriously limited as an air defense weapon against today's sophisticated air threat. It is important today because it is the only dedicated ADA system the Army has which offers any armor protection at all, and because it preserves the active force structure essential to the ADATS follow on - no small consideration in this time of force structure cuts. The limitations of the Vulcan as an ADA system, however, were not missed by the Congressional Budget Office (CBO) in a 1986 report to the Congress which stated that it "offers little capability against enemy aircraft, especially helicopters that can stand off at long ranges while attacking tanks and other armored vehicles."<sup>35</sup> It was primarily these serious limitations of the Vulcan that initially led to the attempted upgrade to the SGT York, limitations that

have only grown more severe in the four years since that system was canceled.<sup>36</sup> According to the report:

Although each Army division does include weapons designed specifically for air defense, they are, for the most part, old and ineffective against even today's threat, much less that anticipated in the 1990s. The Vulcan 20mm anti-aircraft gun, for example, entered the inventory in the late 1960s and does not have adequate range to destroy modern enemy aircraft before they launch or fire their weapons. Other air defense weapons have similar defects.<sup>37</sup>

The Stinger is a follow on to the REDEYE Man-Portable Air Defense System (MANPADS) of the early 1970s.<sup>38</sup> The system is deployed in teams of two soldiers (a gunner and a team chief) in an organic HMWV with trailer to carry the basic load of 6 missiles. Typically, five Stinger Teams comprise a Stinger Section, the smallest element capable of achieving adequate mass.<sup>39</sup> Thus, to retain mass, the division can protect a total of 12-15 critical assets with its 72 Stinger teams; the brigade (again, assuming even distribution) a total of 4-5 critical assets. Doctrine further states that if the threat is severe or the supported unit widely scattered, mass may not be possible with less than two sections (10 Stinger teams).<sup>40</sup> To achieve mutual support, Stinger teams should be positioned within 2000 meters of each other.<sup>41</sup>

Unlike the Vulcan, Stinger is a very capable air defense weapon system. Unfortunately, it has serious operational limitations when deployed in the forward area, especially in offensive operations, because its organic transportation is seriously deficient in meeting basic battlefield requirements. FM 44-16, Platoon Combat Operations - Chaparral, Vulcan, and Stinger, dated May 1987, states:

Two factors, mobility and vulnerability, are critical considerations when planning Stinger support for an offensive operation. The crew's organic wheeled vehicles may be unable to accompany armor or mechanized infantry forces in some cross-country movements....Because of the organic vehicle and the fact that Stinger must be fired from an exposed position, Stinger crews will be more vulnerable to enemy direct and indirect fire than the unit they are supporting.<sup>42</sup>

Therein lies the core of the "Stinger Under Armor" rationale, provided in clear text in ADA doctrinal publications.



## CALLS FOR CHANGE - CHALLENGE AND RESPONSE

...This issue of survivability for the MANPAD crew has been brought up and shot down for the past 20 years. The Stinger, no matter what form, has the potential to be one of the most cost-effective weapon systems on the modern battlefield. The concepts and doctrine which put the STINGER team in a wheeled vehicle were developed with logic from the sixties era. Ideas, doctrine, and the threat have evolved since then.

COL Peter W. Bradley  
TRADOC SYSTEM MANAGER  
- SHORAD C2/Stinger  
28 May 1985<sup>43</sup>

This section examines the history of the issue and the audit trail of the responses from the field and within the Institutions of the Army. The issue of "Stinger Under Armor" has roots that reach from early unit experiences at the NTC to the SGT York Follow-on Evaluation (FOE I) conducted in the Spring of 1985 at Ft. Hunter-Liggett, California, where it first gained pronounced visibility. During that combined arms test an issue surfaced concerning the employment of Stinger teams representing the normal division slice from the 2nd Armored Division, the parent headquarters for the test maneuver unit. According to documentation from the Air Defense Artillery School, the 2nd Division Commander was adamant that the Stinger teams be employed "Under Armor" for better survivability during the FOE.<sup>44</sup> The Division commander's concept was to split the two-man Stinger crews placing the Stinger crewmen on maneuver unit armored vehicles (M2 Bradleys).

The Air Defense Artillery School's response evidenced serious concern over this emerging concept. In its review of the "piggybacking" concept, the Tactics Department strongly disagreed with the concept for the following reasons:<sup>45</sup>

- (1) places critical engagement decisions on crew chief and gunner independently in violation of basic doctrine and operating principles of the system.
- (2) seriously degrades command and control and early warning since crews are separated from their organic communications equipment.
- (3) denies the crew the ability to observe enemy aircraft.
- (4) prevents preparation for engagement until the crew dismounts.

- (5) forces gunner to dismount, prepare the weapon, locate and identify aircraft, and engage while under air attack without adequate early warning.
- (6) degrades effective air defense planning.
- (7) degrades principles of mass, mix, mobility, and integration.
- (8) denies Stinger crew the ability to locate in positions where it can best perform the air defense mission.
- (9) not responsive to changing tactical situations that might require changing ADA priorities and reallocation of ADA resources.
- (10) removes control of ADA officer over planning, tactical employment, reconstitution, and missile resupply.
- (11) separates team from basic load.

The recommendation of the Tactics Department was that Stinger be employed "according to doctrine with organic vehicles."<sup>46</sup> Although this would have forced the Stinger crews involved in the testing to operate farther behind the task force, perhaps reducing early engagement capability, it would have afforded them the opportunity to use commanding terrain at Ft. Hunter Liggett (location of the SGT York FOE) ideally suited for Stinger use.<sup>47</sup>

The Commandant of the Infantry School voiced related concerns in a message to the Commandant, USAADSCH, dated 21 May 1985:

...The M2 Bradley Fighting Vehicle is a squad fighting vehicle and the Infantry Maneuver force cannot afford to lose 2 to 4 fighters for a Stinger Team and their equipment because it would reduce an already limited dismounted Infantry strength...The attached Task Force ADA Teams should not be piecemealed down to company level. Rather, they should be at battalion level to support the battalion overall and attached to companies only when required. The Infantry School fully supports an improved gun/missile support to the maneuver task force. We do not see it as modification of Infantry vehicles - rather as an addition of ADA vehicles to the structure.<sup>48</sup>

Notwithstanding these serious objections, the prerogative of the Division Commander to employ his organic ADA assets as he desired rather than as the Air Defense School suggested was preserved. However, the non-doctrinal employment profoundly affected the results of the FOE<sup>49</sup> and more importantly established precedent and legitimacy for "Stinger Under Armor" at a time when the whole concept of forward area air defense was undergoing dramatic change. These changes provide important context for the "Stinger Under Armor" issue.

After the SGT York system was canceled, Stinger became more than a supporting system for the primary forward area air defense weapons; it became the primary system for defense against helicopters in the forward area. That was a role it had not been designed for, and more importantly, it was a role its organic vehicle was incapable of supporting in mid-to-high intensity offensive operations. These problems would manifest themselves repeatedly at the NTC as units sought the proper balance between effectiveness of Stinger and its survivability, a balance that would remain elusive without the true audit of combat.

By July 1985, the Tactics Department at Ft. Bliss acknowledged the observation of NTC Controllers that Stinger deployed in the forward area was susceptible to heavy threat indirect fires and could not survive.<sup>50</sup> At that time, the NTC apparently advocated that Stinger be placed "Under Armor" to "resolve this issue."<sup>51</sup> Again, the ADA subject matter experts reiterated the multiple reasons why this concept should not be accepted. But rotations at the NTC continued to identify the survivability issue and put pressure on the Air Defense Artillery School for action.

In a 20 November 1985 Memorandum for LTG Riscassi (then Army DCSOPS) from BG Leland (NTC Commander), the following observation was noted:

...ADA weapons should be employed by the ADA plt ldr/btry CO except for STINGERS attached to selected companies during mobile operations -- a procedure recommended only because of the necessity to provide protected mobility...<sup>52</sup>

In this same document, BG Leland suggested that frequent changes in task organization should be avoided because they degraded teamwork with marginal benefits to force mix. He also indicated the serious difficulties in timing task organization changes as well as the problems related to coordinating SOPs and logistics resupply.<sup>53</sup> Both of these issues related to the employment of ADA assets on the AirLand Battlefield as articulated in FM 44-1, the capstone ADA manual of the day.

By 1 May 1986, the NTC was reporting through the Combined Arms Training Activity's (CATA) NTC Lessons Learned News Letter that the piggyback technique represented an approved interim solution (read pre-FAADS) to the problem of Stinger team survivability in offensive operations for the heavy task force.<sup>54</sup> This technique required the Stinger gunner to ride with either the FIST or the Infantry company XO. The "assistant gunner" (I assume the reference was to the crew chief) was to follow with the

remainder of the team's basic load of missiles in his 1/4 ton [HMMWV] at the company or task force combat trains. The "interim solution" article frankly admitted the clear disadvantages of the technique:

- (1) the company vehicle is not likely to stop until after the air attack has already begun.
- (2) the Stinger team is separated.
- (3) early warning is difficult to disseminate to the team members.
- (4) the team is left with little or no dedicated communications.
- (5) flexibility for positioning the Stingers is limited which contributes to degraded effectiveness.

Yet the same section attempted to discount these considerations by describing the following as potential work-arounds:

- (1) adequate early warning.
- (2) dedicated ADA C3I.
- (3) effective Tactical SOPs.

These represented wishful thinking more than a truly workable solution to the problem reflecting combat realities, given the disadvantages discussed previously. Nonetheless, the article described a procedure whereby the Stinger section sergeant (assuming one was available) was to use the Task Force command net through the company team commander to pass early warning.<sup>55</sup>

In September 1986, CATA furnished additional information to the field on the subject of Stinger survivability.<sup>56</sup> The strongest statement on the subject to date offered the following observations:

The lethality of weapons on today's battlefield makes it imperative that the Army take measures to increase the survivability of Stinger teams. The task force can accomplish this by either placing them in a dedicated carrier under armor protection or by digging the team in with the required 18-36 inches of overhead cover.<sup>57</sup>

The Newsletter continued with the observation that the preferred method of employment of Stinger in offensive operations was to place the teams in dedicated carriers "such as the M113."<sup>58</sup> Such employment was said to offer increased survivability, increased command and control, mobility equal to that

of the supported force, and increased ammunition-carrying capacity if the carrier was modified with a missile ready rack. Although support for this new option was emphatic, the article clearly indicated that the greatest shortcoming of this option was the availability of the M113. It mentioned one unit's method of using M113s from the division's SHORAD Battalion Chaparral platoons, but noted that this workaround was temporary due to the pending transfer of Chaparrals to Corps level under the AOE concept. Finally, the article mentioned a related innovation by one unit which developed a missile ready rack capable of storing 9 Stinger rounds in the M113 as an interim solution to the problem "until the Army gets a more survivable vehicle for Stinger employment."<sup>59</sup>

By 1987, the NTC was approaching the problem of forward area air defense from a different perspective. The 27 February 1987 edition of the CATA newsletter stressed the importance of maneuver units using organic capabilities in the air defense role.<sup>60</sup> The report stressed the point that the maneuver commander could not rely solely on ADA systems to provide the required degree of protection against air attack.

Many of these comments were reflected in a special NTC Lessons Learned Newsletter entitled Commander's Comments - The CS Team published later in the year.<sup>61</sup> The information in the report had been extracted from a study conducted by the Army's Research Institute (ARI), and consisted of candid comments by battalion and brigade commanders following their rotations at the NTC on the employment of combat support assets. The lessons in this report constituted what ARI considered to be the most significant lessons on the use and synchronization of CS supporting the heavy force. In a section on ADA, the following observations were offered:

Give Stinger teams the same protection and mobility as the unit they are supporting...TF was forced to have Stinger teams ride on or in M113 vehicles organic to the company. This caused ADA coverage within the company to suffer because Stinger teams were seldom given time to dismount during enemy air. Secondly...resupply of Class V was a problem. They couldn't carry enough with them because of lack of space for a substantial mission. ADA coverage within companies suffered because of lack of a dedicated ADA vehicle.<sup>62</sup>

Other related observations were also made. One commander addressed the issue of survivability and mission accomplishment squarely:

...The crew must fight both an air battle and a ground battle....terrain requirements which best satisfy one mission will least satisfy the other....It is not enough to say that mission accomplishment always takes priority because careless employment that supports aircraft destruction, but needlessly exposes a critical ADA asset to hostile ground fire is operationally unsound. In the SHORAD air battle....The squad leader is the key decision-maker on the battlefield....<sup>63</sup>

The article concluded the section on ADA with the stark observation that the "overall performance of task force elements responsible for active and passive air defense measures is weak....task forces and air defense personnel are overwhelmingly weak in the planning and execution of air defense doctrinal standards. "<sup>64</sup>

The Air Defense Artillery School had taken note of the concerns from the field and was working to correct the problem. It is important to remember that in the shadow of the SGT York failure, the school was absorbed with issues that cut to the core of the Branch. Although these issues eventually led to the successful FAADS concept, the point is that the ADA school was a hub of critical activity from 1985 - 1987; it was not simply ignoring the Stinger issue in the interim. In fact, on 2 July 1986, the Secretary of Defense was informed during an Air Defense Artillery Laydown briefing that a Stinger crew member would be added to each three-man Vulcan crew during FY 1986 as an interim measure to help fill the void created by the SGT York cancellation.<sup>65</sup> By 4 September 1986, the school had begun to act on its promise by drafting a letter to Army Materiel Command recommending their position on a modification kit to Vulcan to enable it to carry 2 Stinger rounds.<sup>66</sup> In recognizing the limited availability of the M113s in the Chaparral Batteries, the ADA school had evidently decided on an alternate course of action that centered on adding Stinger to the Vulcan as a solution to the "Stinger Under Armor" issue.<sup>67</sup>

In February 1987 the ADA school published Air Defense Artillery Lessons Learned Bulletin Number 1-87 which focused almost entirely on the "Stinger Under Armor" issue.<sup>68</sup> That document presented a number of "doctrinal positions" to provide what it termed "an acceptable level of survivability as an interim measure while awaiting fielding of the LOS-F(H) component of FAAD."<sup>69</sup> Clearly, the school saw the real solution to the problem to be FAADS. Then, as has often occurred in the past, the Branch put its hopes for solving a current problem on a future system. Unfortunately, this reflects the very same kind of thinking which caused the extremely serious forward area

vulnerability to the heavy division when the SGT York was canceled 2 years previously.<sup>70</sup> Although this methodology deserves separate consideration apart from this study, there can be no doubt that the Air Defense school's focus on FAADS impacted on the "Stinger Under Armor" solutions it finally offered. The three solutions offered at this time were:

- (1) place Stinger in the Chaparral platoon leader's M113 as long as the M113s are available.
- (2) place Stinger with the Vulcan platoon leader.
- (3) use a Stinger gunner as the fourth crew member of the Vulcan crew.

Regarding this last option, the Bulletin stated that USAADASCH had recently published guidance to the field in FC 44-16R/16S. It also stated that these solutions were "doctrinally and practically sound...as applicable to wartime situations as they are to training exercises, such as the National Training Center."<sup>71</sup>

Yet problems in the field persisted, some challenging the efficacy of the "school solutions." An insight into such thinking is provided by an undated letter by the commander of 2d Bn, 5th ADA (apparently written in late March or early April 1987) which took the school to task in a number of areas. The letter had been prompted by the guidance to the field published as FC 44-16R/16S, Vulcan/Stinger Integration, in September 1986, and by resulting changes to the AOE TOE.<sup>72</sup> The commander emphatically disagreed with the Vulcan-Stinger integration as the best solution to the "Stinger Under Armor" problem, indicating his preference for a dedicated M113 as the preferred option. His reasons warrant consideration:

All currently "Approved" methods of deploying Stinger under armor have been tested by this battalion and do not work. HMMWVs cannot survive in the forward area where they must be employed. Stinger deployed with FIST vehicles, company team commanders/XOs or any other vehicle makes command and control difficult and allows engagement of targets of opportunity only....Stinger in Vulcans also failed during testing...The concept is flawed...<sup>73</sup>

The commander's concluding paragraphs are a poignant reminder of the vast gulf that all too often separates the fields of practice from the garrisons of doctrine:

In light of the above experiences, I cannot as a leader employ concepts that I know cannot work, when my soldiers know and train with a concept that does...My battalion will do what it must do to fight, win, and survive.<sup>74</sup>

Significantly, he also took the school to task for failing to coordinate its position with field commanders before approving it.<sup>75</sup>

In his review of the letter, the Director of the Tactics Department, USAADASCH, agreed that "giving the Stinger a dedicated APC from the Chaparral platoon is the best solution."<sup>76</sup> He also stated that alternative solutions were not as successful, and were training intensive, yet represented viable options until a FAADS LOS-F-(H) system was fielded. The response acknowledged that if the only option exercised for the Stingers was as the 4th Vulcan crew member, then "ADA capabilities, vulnerabilities, and coverage definitely suffer."<sup>77</sup> Apparently, even within the school, the concept approved as "Stinger Under Armor" by the ADA school was a limited response in many regards. Yet in the March - April edition of Air Defense Artillery, the headline focused on the feature article "Plans Jell for Stinger Under Armor," an article devoted entirely to the addition of Stinger to the Vulcan as the USAADASCH solution to the problem.<sup>78</sup>

The problem persisted. By April 1988, the Center For Army Lessons Learned (CALL) had picked up the CATA baton for reporting NTC lessons learned, and the vehicle to transmit these lessons was the CALL Lessons Learned Bulletin. In its Fall 1988 Compendium Issue, the "Stinger Under Armor" issue resurfaced as one of only two ADA issues discussed.<sup>79</sup> The ADA lessons learned basically revisited doctrinal ground fought over since 1985. The Bulletin identified that Stinger crews in their organic thin-skinned vehicles "may not survive" in offensive operations because the crews are extremely vulnerable to direct and indirect fires. Unlike previous formats, however, CALL incorporated a section entitled "Successful Tactics, Techniques and Procedures." This section recommended the following "Stinger Under Armor" listed in order of preference:

- (1) dedicated M113 - identified as the best option, but required a dedicated radio.
- (2) Infantry Company XO's vehicle if early warning was possible.
- (3) FIST track - identified as a poor option which interfered with the FIST mission.



(4) as the fourth member of the Vulcan squad in heavy divisions - identified very limited ammunition-carrying capability as the Vulcan was not designed to carry extra missiles.

This listing is interesting in that it placed the "solution" advanced by the U.S. Army Air Defense Artillery School (USAADASCH) as a less desirable option than options not even identified by USAADASCH as acceptable solutions to the problem.

#### REVIEW OF THE BIDDING

By now, the reader is likely confused about the precise meaning of the term "Stinger Under Armor," and with good reason. By 1989, the term had come to embrace a number of techniques bringing varying degrees of effectiveness and survivability to Stinger teams operating in the forward area. To the Air Defense School, the term became attached to the addition of a Stinger gunner to the Vulcan crew, documented by the release of a Field Circular. To the field, Stinger Under Armor took on local meanings based primarily on what worked at the NTC or in the local environment.

In addition to the variants of "Stinger Under Armor" presented above, a search of extant literature reveals the following specific local techniques attempted during the 1985-1989 period:

(1) 101ST Airborne Division (2-44 ADA) used a combination of air ambushes across the FEBA, commando-style raids in concert with small infantry units (LRSD), and experimentation with early warning procedures.<sup>80</sup>

(2) 2d Infantry Division (2-61 ADA) arrived at an effective local solution to the problem by arranging for an intra-divisional swap of 24 HMMWVs for 24 M113s totally dedicated to armoring Stinger teams.<sup>81</sup> They also developed four Stinger Initiatives appropriate to the Division's wartime mission.<sup>82</sup> These evolving initiatives were:

a. Stinger on the DMZ: as the Division's infantry battalions rotate through 10 week cycles of patrolling the DMZ, providing guard post security, and serving as a ready-reaction force in their assigned sector, they take their "habitually" associated Stinger section with them.

b. Stinger Airmobile: the rugged, steep hills and valleys of Korea make proper positioning of Stinger teams difficult. Helicopters are used

to insert Stinger teams on the mountains and ridges in positions which maximize their observation and fields of fire along identified air avenues of approach.

c. Stinger Firetraps: another term for air defense ambushes set up based on extensive METT-T analysis to identify most likely high speed air avenues. Teams are positioned well forward along these avenues, and they are provided with early warning from the Air Force and the ADA Battalion's organic EW radars.

d. Stinger with Special Operations Forces (SOF): deep battle option whereby Stinger teams target 2d and 3d echelon air assets as well as airborne command posts in the enemy rear.

(3) 24th Infantry Division (5/52 ADA) also used a variety of compromise solutions during its NTC rotation.<sup>83</sup> These included using the Chaparral Platoon leader's APCs for Stinger crews, and placing other Stinger crews in the Vulcan Platoon leader's APC. Additionally, the unit supported task force offensive operations with an ADA battery (-) to provide greater mass and improved CSS support to the fire units.

(4) In a recent rotation to the NTC, the 3rd Armored Cavalry Regiment (ACR) (supported by D Btry, 5-62 ADA and organic Stinger Platoon) reportedly used Stingers under armor in either FIST or Vulcan tracks although the unit also had a Chaparral platoon to augment the organic Stingers.<sup>84</sup> The Squadron Operations Officer reported the armoring of Stingers as essential to their survivability, but concluded that "the interim fix of placing them with the Vulcans proved unsatisfactory - the Army needs a better answer."<sup>85</sup>

(5) The 11th ACR also recognized the serious problem in the covering force area during the pre-FAADS era, and developed local fixes. In an innovative and unorthodox approach to the problem of CFA ADA, the unit developed a set of criteria then conducted an analysis of alternatives to select the best approach.<sup>86</sup> The criteria included "flexibility," "command and control," "suitability of firing positions," "cover," "mobility," and "probability of kill." The solution chosen by the unit was termed "Blackhorse STUNAR (for "Stinger Under Armor"). It involved placing Stinger under armor by equipping Ground Surveillance Radar (GSR) crews with Stinger weapons. Thus, the GSR crew becomes responsible for two missions which the author of

the article claimed to be deconflicted. The missiles for the GSR crews were obtained from the basic load of the Stinger platoon. This reduced the basic load for the Stinger teams from 144 missiles to 120 missiles while pushing 24 missiles forward for use by the GSR teams. These teams were to be tied in to the ADA command and control network, though positioning of the GSRs would remain with the squadron S-2, "allowing the squadron to retain independent control over a valuable intelligence and air defense asset."<sup>87</sup>

On the one hand, it is encouraging that so much activity was generated by the field to address the glaring deficiencies of air defense in the forward area. Yet one cannot help but wonder why the onus for resolving this combat development problem was left to the field which lacked both the analytical tools and resources to find adequate resolution. One must also question the reasons why the Air Defense community reacted so slowly and over the space of 4 years, only to offer a "solution" that the field largely found unworkable. Perhaps it was the forward-looking promise of FAADS. Perhaps it was the thought that an aggressive fix to the Stinger problem would jeopardize that future program to the serious detriment of the 1990s air defense of the forward area. Whatever the cause, the facts at the end of 1989 attested to the ADA School's continued hope in FAADS as the answer to the Stinger vulnerability issue, to the continued existence of serious problems in air defense at the NTC, and to aggressive, if local, attempts by commanders in the field to "plug the gap."

Whatever else it might be, "Stinger Under Armor" was not a singular concept, nor was there a single, simple way to assess effectiveness for each of its manifestations. An attempt at that analysis will be the subject of the next chapter, but before moving on, it is worthwhile to briefly consider historical lessons learned regarding air defense artillery.

## HISTORICAL IMPERATIVES

What helpful information does historical experience have to tell us about air defense artillery? Search of the literature on the subject reveals that the linkage between current ADA doctrine and historical imperatives is surprisingly consistent and coherent. The simple message is that to be effective, air defenses must be massed, mixed, and mobile - these elements form a sort of doctrinal pyramid that can only be violated at great peril to both the supporting air defense units and the maneuver units they support.

In a seminal work tracing the roots of Air Defense Artillery from its genesis as the Antiaircraft Service of the U.S. Army in 1917-1918, Major Charles E. Kirkpatrick acknowledged glaring similarities between doctrine of the A.A. Service and present day ADA doctrine.<sup>88</sup> According to Kirkpatrick:

All of the elements of tactical doctrine used by the A.A. Service are likewise elements of present Army Air Defense Artillery doctrine. One of the air defense lessons reinforced by the experience of Vietnam was the 'importance of deploying a mix of complementary air defense systems'...The other basic principles and employment guidelines of air defense today sound very much like those used in 1918 too: use of antiaircraft weapons in mass and in a proper mix, mobility, integration of defensive efforts, balanced fires, weighted coverage, mutual support, overlapping fires, early engagement, and defense in depth....All of those techniques were first tried and used in World War I and, having proved sound, retained in the years since.<sup>89</sup>

Another recent publication, Archie, Flak, AAA, And SAM, by Dr. Kenneth P. Werrell, traces the operational history of ground-based air defense from World War I through the regional conflicts of the 1980s.<sup>90</sup> While confirming the assessments in Kirkpatrick's work for WWI and carrying it through WWII, he also provides brief reviews of the importance of airpower and air defenses through the series of Arab Israeli Wars (1948, 1956, 1967, 1967-1973, 1973, and 1982); U.S. air strikes in the Middle East (1983-1986); the Indian Pakistani Wars (1965, 1971); the Falklands (1982).<sup>91</sup> The common thread that ties the discussion of each of these conflicts to ADA history is the potential of ground-based air defenses that are massed, mixed, and mobile to "make the difference."<sup>92</sup> Repeatedly, those nations that developed and fielded air defenses within these parameters succeeded. Those who ignored them were defeated on the battlefield.

Lessons of history are not limited to the U.S. Army, although our actions occasionally betray the existence of such myopic thinking. We can and should look beyond our own experiences to see how others adapt to history - if only to confirm the course we are embarked on in terms of doctrine and materiel development. In a recent challenge to myopic thinking, Major Robert H. Haseloff's article on the evolution of Soviet Air Defense Evolution reveals the adaptation of Soviet air defenses to the lessons of history.<sup>93</sup>

He claims, for example, that lessons from the Korean conflict led the Soviets to replace heavy antiaircraft guns with surface-to-air missiles.<sup>94</sup> This lesson was later passed on to the North Vietnamese whose mix of guns and

missiles proved effective until 1972 when the U.S. overwhelmed their integrated air defenses. The Soviets were already developing a more formidable net of linked SA-2, SA-3, and SA-4 surface-to-air missile (SAM) systems. In 1967, the first mobile SAM, the SA-6, was introduced. This system was employed by the Egyptians in the 1973 War alongside the ZSU-23-4 gun system. The combination proved so effective that the Israelis lost over 100 aircraft and could not gain the initiative on the battlefield until the integrated ADA system was destroyed.

But the Egyptians had their problems as well. Although some progress had been made toward increasing the mobility of their integrated air defenses, they were still not able to keep up with the supported maneuver force.<sup>95</sup> As the Egyptian ground commanders sought to exploit their initial successes on the battlefield by seizing the passes leading out of Sinai, their armor columns became vulnerable targets for Israeli aircraft. The air defense commander had recommended a "creeping" advance to retain the viability of the air defense coverage, but his advice was rejected.<sup>96</sup> As a consequence, the initiative was lost, the ADA batteries became strategic targets for the Israelis, and once the integrated air defense was defeated on the ground, the Egyptians surrendered the initiative to the Israelis.

The lesson that modern heavy forces required massed, mixed, and mobile air defenses was not lost on the Soviets as they continued over the next 10-15 years to upgrade air defenses for their ground forces. In describing Soviet concepts in ADA, Haseloff summarized:<sup>97</sup>

...The Soviets' approach to air defense is normally described as the "three M" approach - mass, mix, and mobility.

...The first is a reflection of a standard principle of Soviet military art: mass has a special impact...on the enemy. If all other things are equal, quantity will prevail.

...The second principle of Soviet doctrine is mix. Here they reinforce the effort of mass by ensuring coverage of every vital target by several types of missile and gun systems.

...Mobility is the final principle and is emphasized in weapon systems design. This has been proven during the past 20 years of antiaircraft system development.

The common caution when examining any aspect of the Soviet military art and science is to avoid "mirror imaging." Certainly, the differences between the command economy of the USSR and the democratic capitalism of the United States make it easier for the Soviets to obtain the systems and force

structured required by their doctrine. Yet perhaps in the field of air defense artillery, we should examine our own image more closely to assess whether our materiel differences reflect differing interpretations of history or flaws in the way we translate those lessons into action. The Soviets have long appreciated the historical imperatives of massed, mixed, and mobile air defenses protecting their maneuver forces and have translated them into a robust force structure. Each Soviet Motorized Rifle Division has a total of 20 SA-6 (or SA-11) surface-to-air missile systems, 16 SA-9 (or SA-13) surface-to-air systems, 120 SA-7 (or SA-14) shoulder-fired air defense systems, and 16 ZSU-23-4 23mm self-propelled anti-aircraft guns.<sup>98</sup> That forward area air defense is linked to a robust ADA network behind it. Because of the robust numbers of active ADA systems dedicated to the defense of maneuver units, issues such as "Stinger Under Armor" have not arisen. The entire issue of "Stinger Under Armor" is a reflection that our commitment to these same principles is stronger in word than in deed, at least during the pre-FAADS window of vulnerability.

## CHAPTER 3

### Analysis of Alternative Strategies

The preceding sections have established the historical validity of current ADA doctrinal principles of mass, mix, mobility, and integration. They have also revealed the importance of linking doctrinal requirements to the materiel acquisition process lest an army find itself ill-equipped to fight the fight its doctrine envisions. Lacking both confidence in, and requisite tools for, quantitative analysis, I have elected to analyze alternative strategies for "Stinger Under Armor" using a matrix based on doctrinal requirements and force development considerations.

#### ALTERNATIVE STRATEGIES

As suggested in the last chapter, in the four years since "Stinger Under Armor" gained appreciable visibility, many variants have developed. No comprehensive comparison of these basic alternatives executed in the manner attempted here has been published. Although it is likely that options other than the ones examined in this chapter exist, it should be possible to assess them in the same manner as those considered here. The basic alternatives considered in this analysis are:

- (1) COA 1: Stinger in organic HMMWV (BASE CASE).
- (2) COA 2: Stinger in supported unit armored vehicle.
- (3) COA 3: Stinger in Vulcan.
- (4) COA 4: Stinger in dedicated M-113.
- (5) COA 5: Stinger weapon with non-dedicated gunners.
- (6) COA 6: Stinger hunter/killer teams.

#### MEASURES OF EFFECTIVENESS

This section presents the matrix construct used to compare the various options and establishes baseline criteria for system performance within this construct. The primary measures of effectiveness are divided into two functional categories - COMBAT FACTORS (CF) and FORCE DEVELOPMENT (FD) criteria.

The CF category comprises the following sub-categories and criteria:

(1) CF 1: SHOOT - does the strategy fulfill the following requirements:

(a) Support timely execution of the basic tasks of execution:

1. DETECT?
2. ACQUIRE?
3. IDENTIFY?
4. ENGAGE?
5. DESTROY?

(b) Facilitate mass and mix of ADA weapons?

(c) Provide operational flexibility?

(d) Not interfere with supported unit mission execution?

(2) CF 2: MOVE - does the strategy provide mobility equal to that of the supported force?

(3) CF 3: COMMUNICATE - does the strategy provide the Stinger team with sufficient communications capability to conduct its air defense mission and to integrate its operations with the supported force?

(4) CF 4: SUSTAIN - does the strategy provide for continuous combat service support of the Stinger teams over extended distances?

(5) CF 5: SURVIVE - does the strategy protect the Stinger teams from the effects of direct and indirect fires to ensure their availability for follow-on operations?

These elements are derived from a careful integration of the basic ADA doctrinal principles (mass, mix, mobility, and integration), ADA Tasks of Execution (Shoot, Move, Communicate, Sustain, and Survive), and sub-tasks within the "shoot" task.

Additionally, because the most combat effective solution is useless if it is not feasible, each strategy will also be assessed against FD criteria as follows:

(1) FD 1: COST - what is the cost above and beyond the current system of Stingers and their organic vehicles?

(2) FD 2: AVAILABILITY - is the equipment necessary to execute the COA available in the Army inventory?

(3) FD 3: FEASIBILITY - given current budgetary and force structure constraints, is the COA feasible in the peacetime environment?

(4) FD 4: MODERNIZATION IMPACTS - If the COA is executed does it impact negatively on other modernization programs?



## COMMENTS ON VALUES

Each COA (alternative strategy) is subjectively compared to the base case (Stinger in HMMWV) and assigned a point value for each criterion. For the COMBAT FACTORS values between +1 and +10 are assigned to reflect relative benefit of the considered strategy compared to the base case. A value of +10 does not mean that the option meets the criterion perfectly. It simply means that the option provides the same basic benefit in the particular criterion as the base case. In relative terms then, a value of +8 to +9 represent minimally reduced performance. Values of +5 to +7 indicate significantly reduced performance. Values between +3 to +5 imply seriously deficient performance. Any value below +3 indicates relatively unacceptable performance.

For FORCE DEVELOPMENT criteria, values between -1 and -10 are awarded to reflect the negative impacts of each option on the current force development plan. A value of -10 indicates the most serious impact in the given criterion, while a value of -5 reflects moderate impact, and -1 describes minimal impact. For example, an option that threatens to derail the current modernization plan would likely receive a value between -8 and -10 depending on the severity of the threat. An option that forced the acquisition of a major new system would likely be awarded a -10 to reflect its severity, while one simply requiring a reprioritization of existing assets might be awarded a -5 indicating a significant, but not extreme, impact.

As none of these options has been tested in the "crucible of combat," I felt that subjective comparative analysis using these criteria was as credible a method for assessing the COAs as any other method. Perhaps it is even more rigorous than most because it demands comparative evaluation rather than independent assessment of option effectiveness.

From the outset, I must acknowledge a personal bias against the use of numbers for such comparisons, not because there is anything intrinsically wrong with them, but because they tend to make subjective judgments appear to be more objective than they really are. Used correctly, numbers can provide a sound framework for comparing related alternatives. But the reader should never lose sight of the bottom line - the numbers are a reflection of subjective comparative assessments, nothing more or less than that. The matrix is simply a tool to view a significant number of alternatives in a cohesive manner. The numbers I have assigned any option or any category represent personal judgment derived from my research. In every case, I will

provide my rationale. Each reader should apply his own expertise and experience to the same construct.

In this regard, I should further note that in the course of my research, I determined that some factors appear to be more important in war than they would in peace, while others have relevance only in peace. Virtually none of the force development issues, for example, is likely to sway national decisionmakers in time of war. Similarly, some of the combat factors such as "survive" are likely to be of such importance in time of war that their comparative value would increase.

This simply indicates that context is important. The matrix construct can serve as the basis of decisions, and as a check on those decisions, in any context. What is important, however, is that some context be established from the outset, and differences in context, and therefore weighting of factors, be acknowledged. This analysis assumes the current peacetime environment. Were war to break out tomorrow, it is unlikely that the force development criteria would be of any consequence at that time.

## ANALYSIS OF ALTERNATIVES

Each of the alternative strategies discussed below is compared in Table 1 (see page 30).

A. COA 1: STINGER IN ORGANIC HMMWV. This is the base option employing Stinger in its organic HMMWV vehicle. Because it is the base case, this COA is assigned a value of 10 for all categories except those which represent major deficiencies noted at the NTC or in the field which led to the "Stinger Under Armor" concept in the first place. Thus, the COA is assigned a value of 0 for MOVE and 0 for SURVIVABILITY against both direct and indirect fires. These represent the major reasons why Stinger has been placed under armor. It is also assigned values of 5 in the criteria of OPERATIONAL FLEXIBILITY and INTEGRATE WITH SUPPORTED UNIT because the HMMWV is inherently limited in its ability to operate effectively over the same terrain as the supported unit. Because of these limitations, it is more difficult to integrate the Stinger teams in the supported unit's scheme of maneuver and to retain communications with the supported unit as they could if they maneuvered closer to the unit. By assigning these values, alternative options may be given comparative values

between 1 and 10 based on the comparative degree of attainment of each criteria relative to the base case.

In terms of the Force Development (FD) criteria, the COA is neutral. As the currently fielded option, there are no FD impacts.

**B. COA 2: STINGER UNDER ARMOR IN SUPPORTED UNIT M2/M3.** This option received low marks in the Air Defense Tasks of Execution for fairly obvious reasons. To DETECT, ACQUIRE, IDENTIFY, ENGAGE, and DESTROY hostile aircraft in a timely manner is difficult for dedicated crews in dedicated ADA vehicles. By placing Stinger in a maneuver unit vehicle, the crew is separated. This denies the team 1/2 of its observation capability while it is essentially taken out of the air battle and placed squarely in the ground battle. That is not likely to be the best position to engage hostile aircraft. The two fights are not identical, nor are the requirements for their successful execution the same. Whereas in COA 1 the crew is free to position itself in the best manner to provide air defense coverage without becoming decisively engaged in the ground fight, in COA 2 this is impossible. The Stinger crewman will only be allowed out of the track when the maneuver unit finds it advantageous to stop and let him out. The chances of that happening at the same time the unit is under air attack are slim - it is precisely when the unit is moving that it presents the most lucrative air target. Even if the vehicle stops in response to the appearance of hostile air, it is not likely to be in optimum position to allow the Stinger gunner to dismount, nor is it likely to remain static until the gunner completes his operations. Moreover, if the Stinger gunner is denied the opportunity to observe the airspace, he is not likely to have sufficient time to acquire, identify, and engage aircraft. In short, the decision cycle for the gunner is compressed, not to fit ADA requirements, but rather to fit ground battle requirements. The compromise does not provide efficient or effective air defense of ground units.

This COA was also cut points in the criteria of MASS and MIX. An essential characteristic of integrated air defenses is their ability to provide mass and mix over critical targets at critical times. By splitting Stinger crews and assigning them to separate ground units, the cohesion of the air defense disintegrates as the Air Defense commander loses control over the positioning of the ADA assets. The ADA planning process detailed in doctrinal publications is as detailed a process as that used by maneuver commanders to develop a scheme of maneuver. Designing an active air defense that provides

Table 1  
ANALYSIS OF ALTERNATIVES

CRITERIA/STRATEGIES	COA 1	COA 2	COA 3	COA 4	COA 5	COA 6
COMBAT FACTORS (VALUES = +1 TO +10):						
CF 1: SHOOT						
A. TASKS:						
1. DETECT:	10	3	4	10	5	10
2. ACQUIRE:	10	3	4	10	5	10
3. IDENTIFY:	10	5	6	10	2	10
4. ENGAGE:	10	5	6	10	5	10
5. DESTROY:	10	5	6	10	5	10
B. PROVIDE MASS/MIX:	10	5	7	10	8	8
C. OPERATIONAL FLEXIBILITY:	5	5	6	10	8	5
D. NON-INTERFERENCE W/UNIT:	10	2	10	10	5	10
CF 2: MOVE						
A. MOBILITY = SPT'D UNIT:	0	10	8	8	10	0
CF 3: COMMUNICATE						
A. ADA MSN REQUIREMENTS:	10	0	8	10	2	5
B. INTEGRATE W/SPT'D UNIT:	5	7	2	10	8	5
CF 4: SUSTAIN	10	2	4	10	2	2
CF 5: SURVIVE						
A. DIRECT FIRES:	0	10	0	0	0	0
B. INDIRECT FIRES:	0	10	5	7	4	2
CF TOTAL	100	72	76	125	69	87
FD CRITERIA (VALUES = -1 TO -10):						
FD 1: COST:	0	0	-1	-5	0	0
FD 2: AVAILABILITY:	0	0	0	-5	0	0
FD 3: FEASIBILITY:	0	0	0	0	0	0
FD 4: MODERNIZATION IMPACTS:	0	0	0	-5	-5	0
FD TOTAL:	-0	-0	-1	-15	-5	-0
EFFECTIVENESS TOTAL:	100	72	75	110	64	87

massed, mixed and integrated air defense coverage over the assets prioritized by the ground commander is a challenge even when the ADA officer has positioning authority over all the ADA assets as he should in COA 1. In the heat of combat, that mission will not become easier. Given the fog and friction of war, if the ADA commander loses control over ADA assets, any mass or mix that occurs is likely to be accidental rather than planned. If the ground commander wants effective air defense, he must facilitate proper planning for the third dimension and resist the temptation to piecemeal assets that are already inadequate to protect even his prioritized assets.

Because this COA takes critically short ADA assets out of the ADA planning process, OPERATIONAL FLEXIBILITY also suffers, but not significantly greater than with the base case. Rapid changes in mission requiring reallocation of Stinger assets, for example, would be virtually impossible to execute in combat. The NTC has established the extreme difficulty of changing task organization during operations, even in a peacetime (albeit high pressure) environment. It is likely that Stinger crew members assigned to maneuver unit tracks would remain with those tracks until a major pause in fighting occurred. Such pauses would likely provide the only opportunities for the ADA commander to shift Stinger coverage.

This COA was given a low rating in the CF of NON-INTERFERENCE WITH SUPPORTED UNIT. It basically places the responsibility for performing the initial stages of the ADA mission on non-ADA crews and vehicles. It forces the supported unit to choose between stopping to let the Stinger gunner out to engage aircraft or continuing to fight the ground battle. As noted above, there is direct conflict between the two missions. If the track stops to let the Stinger engage, it not only paints a target for the attacking aircraft, but it forces the maneuver unit to disengage from the ground battle until the air engagement ends. If the vehicle stops, the next most likely action is for the ground vehicle to come under attack from the air - an M2/M3 with Stingers is not just another track. It is a high-priority ADA carrier. Although minor points, the M2/M3 crew must also contend with the loss of an assigned crew member and they must provide storage and support for the accompanying air defender.

The COMMUNICATE CF was also given low marks. The M2/M3 track was designed with sufficient communications equipment to conduct the ground mission. To establish and maintain a cohesive, integrated air defense of a maneuver unit, all air defense units must be tied together through an ADA

command net, an early warning net, and supported unit nets. These are minimum requirements for an air defense package - without these capabilities, the air defender cannot fit the air defense to the ground operation. Many do not appreciate the fact that the air defense unit has to fight both the ground and the air wars if it is to accomplish its mission and survive. This COA denies the Stinger gunner critical air defense command and control information, and it denies the ADA commander critical information about the air battle and his ADA assets.

The INTEGRATION CF was increased from 5 to 7 simply as a consequence of collocation. Although Stinger in the M2/M3 prevents the ADA commander from designing the best air defense for the highest priority targets, at least the Stinger gunner is aware of the status of the supported unit operation. In spite of this advantage, a higher score could not be given. The ADA defense design phase is the means the ADA commander uses to ensure integration between the ADA assets available to the ground commander and his overall operational concept. With too few active ADA assets to go around, the loss of Stingers to individual tracks is a significant degradation to the overall air defense of the maneuver unit.

The SUSTAIN CF was assigned a value of 2. That may be too generous. The strategy does provide for continuous support of non-ADA requirements, but cannot support sustained operations. The Stinger gunner will not be able to carry over 1 or 2 rounds - he essentially becomes a single shot weapon. Because the crew is separated and the basic load remains in the rear, resupply of Stinger missiles becomes extraordinarily complex. The NTC has long indicated the difficulty of Stinger resupply operations when the Stinger crews remained under the control of the Section/Platoon Sergeant. The piecemealing of the crews across the battlefield compounds the problem, perhaps beyond resolution in high tempo, intense combat operations.

Of course, the primary reason for placing Stinger "Under Armor" was to gain enhanced protection. Thus, this COA was assigned the only 10 ratings for both DIRECT and INDIRECT FIRE SURVIVABILITY. This is not to imply invulnerability to such fires, but rather, relative improvement over the base case. No other option provides the same degree of protection.

As with COA 1, this COA is neutral in terms of FD considerations. Notwithstanding the Infantry School's objections during the early stages of "Stinger Under Armor," Bradley fighting vehicle fielding has been executed without impact. There does not appear to be any action to formalize the

addition of the Stinger gunner in the Infantry squad. When it occurs, it will be the result of a local commander's prerogative.

C. COA 3: STINGER IN VULCAN. This is the Air Defense School approved contribution to the concept. I rate it marginally better than COA 2 for many of the same reasons identified above. In the ADA Tasks of Execution, the scores ranged from 4-6, one point better in each CF element. Again, as with the M2/M3 option, the problem is one of dedication versus opportunity. In a dedicated carrier, the Stinger crew operates as a crew, positions itself to accomplish required tasks, and coordinates all its actions to put lead on the target. Although this COA puts the Stinger gunner in a dedicated ADA vehicle, it is not dedicated to the Stinger gunner or his functions. He is at the mercy of the Vulcan crew for the same functions. He dismounts when and where the Vulcan crew lets him. And because the Vulcan is a different system than the Stinger, the advantages of the Stinger are not likely to be realized. In this regard, for example, the Vulcans are likely to be closer to the ground battle than Stinger would normally be reducing the opportunities for the crew to let the Stinger gunner dismount. The ground battle will simply move too quickly to permit timely engagement, thus, Stinger on-board the Vulcan is more likely to become a weapon of self defense, or a weapon of revenge if the Vulcan is disabled.

In terms of MASS and MIX, this COA is marginally better. An integrated massed, mixed air defense is not achieved by putting multiple systems on a single carrier. There is no depth to such defenses, nor is there any mutual support between the Stinger and Vulcan - instead, dead zones are coincident. If the Vulcan is targeted, the maneuver unit loses not only a Vulcan, but a Stinger as well. Similarly, if the Vulcan stops to let the Stinger gunner engage a target, the advantages of the Vulcan are not offset - in fact, because of its limited range, if the Stinger misses, the Vulcan has invited its own destruction unless it abandons the Stinger gunner and moves to avoid detection.

In sum, the SHOOT CF is assessed as better than in COA 2, but not by much. The greatest improvement in this CF is in the NON-INTERFERENCE category. Although it provides marginal improvements to the ADA mission, at least this COA does not interfere with the maneuver unit. It make no demands on the ground forces, thus it is given a 10 in this area.

In CF 2 MOVE the COA is given slightly lower marks COA 2. While the Vulcan is not as capable as the M2/M3, it is much more capable of supporting the rapid cross country movement in the forward area than the HMMWV. Additionally, the Vulcan has a swim capability.

Minimal points were awarded for COA 3's ability to achieve integration with the supported unit. The rationale is that the Stinger is captive to the positioning and defense design requirements of the Vulcan. The Vulcan is still the primary weapon, and the Stinger is likely to be little more than a fallback capability. As such, the asset is not entirely wasted, but the capabilities of the system cannot be used to advantage. In high intensity offensive actions, the addition of the Stinger is not likely to be a key player - the Vulcan crew will have its hands full with the primary system.

Because the Stinger is retained in ADA channels under ADA control, combat service support will be easier to coordinate and sustain than in the previous COA. Although Vulcan resupply is a recognized deficiency, at least the retention of control within ADA makes resupply easier than it would be if the Stingers were distributed throughout the battlefield without any measure of centralized control.

This COA is given +5 in the SURVIVE CF. Better than the HMMWV, worse than the M2. The Vulcan cannot withstand direct fires, but it does provide some protection from shrapnel and small arms fires.

FD impacts for this COA are negligible. In order to provide adequate storage for 2 rounds in the Vulcan, a special rack had to be constructed. Because of the cost of this rack, the FD criteria were listed as -1.

D. COA 4: DEDICATED M113. The operative word in this COA is "dedicated." Decrements to the Combat Factors for the other COAs were directly related to the lack of a dedicated carrier. The values of a dedicated carrier are clear - they are amply demonstrated in the 1st COA. Having one that provides some degree of armor protection and mobility results in the highest CF total of all COAs. This COA essentially combines the benefits of a dedicated carrier (as in COA 1) with the benefits of mobility and protection of COA 3. It is given a higher score in survivability than COA 3 because it is dedicated to Stinger employment and is not limited by Vulcan positioning requirements. It can achieve better results further to the rear of the supported unit beyond the range of some of the forward deployed threat systems. Even so, it is assigned a 0 for survivability against direct fire.



FD criteria presented the most difficult challenge to the assessment. M113s are available in the Army, but as units undergoing modernization release them to the National Inventory, they have been dedicated to fill long standing shortfalls in other units. The M113 Program Manager stated that although modernization for all Europe units is complete, there is not a single excess M113 in the inventory.<sup>99</sup> He suggested that if "Stinger Under Armor" became an Army priority above those long-term shortages, the vehicles could be provided. He was quite clear, however, that it would take a major Army Staff level or higher decision to make that happen. Contact with the Air Defense School about the issue revealed similar frustrations.<sup>100</sup> Under the current acquisition system, the Air Defense community would have to "pay" a "tremendous bill" for the M113s, using funds from other Important programs, including perhaps the critical FAADS program. Because of these considerations, the force development considerations for this COA are significant. The FD criteria of COST, AVAILABILITY, and MODERNIZATION IMPACTS were each assessed at -5 points each.

Of course, if such reprioritization should occur, these decrements would disappear, and the problem of "Stinger Under Armor" would be favorably resolved until the fielding of FAADS.

**E. COA 5: NON-DEDICATED STINGER GUNNERS.** Failure of the Army to arrive at doctrinally sound, reasonable solutions to the "Stinger Under Armor" issue has led some units to take the matter into their own hands. Without trying to sound judgmental, I think it imperative to caution against this COA. Search of the literature reveals fratricide to be an insoluble problem. The enhanced capabilities of both ADA weapons and aircraft have made fratricide more problematic than ever before. In the absence of an effective, fielded non-cooperative positive hostile identification system, air defense capabilities should be centrally controlled and decentrally executed. Providing GSR crews with Stingers may make the covering force battle seem more secure, but it threatens fratricide.

Some believe that the success of the Mujahideen in Afghanistan with Stinger vindicates the concept of non-dedicated crews. That is an oversimplification. The Stinger crews in Afghanistan were specially selected based on intelligence, literacy, and dependability.<sup>101</sup> They underwent a 2 week 14 hour per day training program with extensive work in tracking aircraft. Engagement drills received top priority, teaching prospective gunners how to

fire from the proper killing aspect and how to use correct gunner actions. Aircraft recognition and command and control, two of the most difficult tasks of a mid-to-high intensity environment, were simply not taught because there was no need. The Mujahideen had no aircraft.

On the battlefields of the future, necessity might dictate that non-dedicated Stinger gunners play a significant role in the counterair battle. Today, the need is not evident. The risk of poorly prepared non-ADA soldiers armed with Stingers engaging friendly aircraft is a serious one. Time and again, rotations at the NTC and JRTC have established that non-dedicated Stinger gunners are ineffective.<sup>102</sup> What is of greater concern is that they may also be dangerous to friendly air. There is a significant difference between the combined arms team engaging enemy helicopters attacking the maneuver unit and non-dedicated Stinger teams operating in the CFA.

Accordingly, this COA was given low marks for the SHOOT, COMMUNICATE, SUSTAIN, and SURVIVE criteria. It was also given -5 points in the MODERNIZATION IMPACTS because of the threat the concept presents to legitimate air defense force structure requirements.

F. COA 6: HUNTER-KILLER TEAMS. Although this COA does not represent a "Stinger Under Armor" technique, it does represent a viable alternative which provides an interesting contrast to the other COAs. Under the concept, teams of Stingers are infiltrated well forward along probable air avenues of approach where they wait until the threat appears. While not appropriate to every operation, the concept may have utility in certain situations, most noticeably when definite, restricting choke points and air corridors exist. Because the option employs dedicated teams in pockets, the COA receives high marks in the SHOOT CF. It is decremented in the MASS/MIX and OPERATIONAL FLEXIBILITY areas because it is essentially a single-shot, if integrated, air defense net. If the threat does not appear where expected, the effects can be dramatic. If the threat does appear where expected, it will eventually change its air axis to adjust to the threat, and the emplaced teams may not be able to be moved in response. This complete lack of mobility warranted a 0 rating in that CF.

The COMMUNICATE CF was also decremented to a moderated level to reflect the likelihood of austere communications capability in the infiltrated areas. Transmissions would only increase the potential of the teams being targeted and destroyed. Also, this COA offers little promise of SUSTAINMENT or

**SURVIVABILITY.** The technique has reportedly been used with some success at the NTC, and again, in Afghanistan where the country lends itself to such operations. All said, this COA appears to be a high-risk, fairly high-gain option in certain types of terrain and in certain operations.

## CHAPTER 4

### Recommendations and Conclusions

The Stinger system platform, man or machine, deserves consideration, otherwise this resource of combat power is neglected and mis-utilized. The tank killer is only one group of weapon systems; the Air Defense family is another. Both work in the same environment and require equal consideration with regard to transportation systems. System effectiveness should come before dollars, and the soldier should come first.<sup>103</sup>

#### SUMMARY OF ANALYSIS

Not unexpectedly, the analysis in the preceding chapter substantiates the relative values to be gained by providing dedicated carriers for Stinger crews. It also confirms the benefits that accrue when that carrier is mobile, armored, and capable of being employed in massed and mixed integrated air defenses. While exception can be taken to the values I assigned to any criterion, the general ranking of alternative COAs should prove solid. The optimum solution for "Stinger Under Armor" is a dedicated M113. Even in a peacetime environment dominated by force development considerations, the combat effectiveness benefits gained by the option substantially outweigh the force development risks. Although the option ranks close in overall effectiveness points with the currently deployed system, readers must remember that the analysis assumes a current peacetime environment dominated by force development considerations. It also assumes that obtaining dedicated M113s can only be effected by HQDA-level reprioritization of available M113s and assumption of moderate-to-significant cost, availability, and modernization program risks. Relief in any of these areas only serves to increase the effectiveness of the option.

The assessment of 15 points against this most combat effective COA due to those peacetime force development issues merits careful consideration. There is something wrong with a system that would force the Air Defense community to put FAADS at risk to close a current, serious gap that exists between air defense capability and need. It should not be a question of FAADS or M113s. Until and unless FAADS is fielded, the risk is great, and the need is evident and has been since the "Stinger Under Armor" issue reared its head in 1985. The Army's acquisition process and perhaps too optimistic an outlook in the Air Defense community have combined to create a serious window of

vulnerability for the air defense of our maneuver forces. It does not have to exist.

Ultimately, it is the field commander who decides how to use his ADA assets. That prerogative will likely always exist, and with good reason. But at what price? Doctrine should not be a noose around the commander's neck, but a tool to help him achieve maximum application of combat power at the time and place of his choosing. The tools provided the commander to achieve that end state should be appropriate and adequate. If the doctrinal proponents (who are also the combat developers) prove incapable of providing useful answers to the field, the field will, as it has often in the past, come up with its own answers. Some of those answers will come cheaply, but some are likely to come at great cost in terms of human life and suffering. It should never come to that if the field and garrison are working together in an environment that encourages Army solutions.

There is a growing need to deconflict the legitimate needs of the field with the acquisition-induced "needs" of the Branch/Service proponents. As the defense budget shrinks to lower and lower levels, the hard questions need to be asked. More importantly, they need to be answered, and answered in timely fashion. Garrison exists to support the field commanders. That focus should never be lost although it is easier spoken than practiced. Battles such as the Stinger Under Armor issue are too important to be left to parochial interests and myopic vision. The Army has a vulnerability today - not through neglect, but through flawed processes and a changed threat. The answers given to the field to date do not inspire confidence in the system. It is time to correct the problem before an adversary denies us the luxury of time.

#### RECOMMENDATIONS AND CONCLUSIONS

We will end this journey where it began. In his recent pamphlet entitled "Challenge & Response: Military Effectiveness 1914-1945," Lieutenant General John H. Cushman, U.S. Army, Retired, wrote:

Our histories tell us that -- whether it be through lack of insight, or of execution, or of both, -- the consequence, in sum, is military folly and failure. In the Vietnam case, a riveting memorial at the west end of the mall in Washington, bearing the names of some 58,000 Americans who deserved better of their military institutions, symbolizes one of the consequences.<sup>104</sup>

He continues with a discussion of the increasing importance of American military institutions in ensuring that both insight and execution are successfully provided. In particular, the role of the service schools is highlighted:

Nowhere is such insight more needed than in the processes through which the future shape of American armed forces, both single- and multi-Service, is determined. Here again, the schools, in close touch with the field commands must be well-springs of enlightened thought....[They must] Break down the compartments of Service parochialism, of "turf," of hierarchical layering, wherever they exist. <sup>105</sup>

War is indeed the great auditor of institutions, of leadership decisions, of policies, and most especially, of actions. As General Cushman suggests, absent the audit of war, insights can also be derived from honest peacetime audits.<sup>106</sup> But insights are of no utility unless acted upon in a timely manner. In the case of Army air defense, the audit has been performed. It was a multi-branch, multi-Service audit performed in the wake of the SGT York cancellation. It found the Army wanting in air defense capabilities in the forward area. And it did result in action - the FAADS program - albeit currently unfielded. That is the long-term answer to the problem of air defense in the forward area. The nagging question is how to fill the growing void until FAADS is fully fielded. The answer this study suggests is to provide Stinger crews with a vehicle appropriate to their critical mission today so that the audit of war will not find one generation wanting, and another one dead.

A number of integrated actions are recommended. First, the Army should reprioritize the redistribution of M113s in the active component to the extent that each heavy division ADA battalion is provided with at least 20-24 M113s (representing roughly 1 carrier per 3 authorized Stinger teams). Second, these carriers should not be charged against any other ADA program, especially FAADS. That long-term solution to forward area air defense needs to be protected. Next, the Air Defense Artillery School should reflect the addition of the M113s in appropriate TOEs, doctrinal manuals, technical manuals, etc. If peacetime force development considerations limit the ability of the ADA battalion to maintain the M113s, support should be provided locally within each division. In no regard should the dedicated vehicles be rejected for want of combat service support. As FAADS is fielded, the M113 vehicles can be reallocated to other priorities on a one-for-one basis, essentially

making "Stinger Under Armor" an effective, dedicated, but short-term loan (assuming FAADS is not indefinitely stretched out).

These actions would substantially close the ADA "window of vulnerability" until completion of FAADS fielding. In the broader picture of things, the Army needs to audit its internal systems, especially those relating to materiel acquisition. Problems such as the "Stinger Under Armor" issue may reflect unhealthy, if unavoidable competition for resources among the Army's proponents under current systems. Service and Branch parochialisms can work together to deny field commanders with workable solutions when they attempt to resolve such issues within the system. That is a no win situation with a predictable price tag should conflict occur. The audit of war is not required to make that determination today, while there is time.

## ENDNOTES

<sup>1</sup>Correlli Barnett, The Swordbearers - Supreme Command in the First World War (Bloomington, Indiana: Indiana University Press, 1963), p. xvi.

<sup>2</sup>U.S. Army, FM 100-5, Operations (Washington, D.C.: HQDA, 1986), pp.11-14.

<sup>3</sup>U.S. Army, FM 44-100, U.S. Army Air Defense Operations (Washington, D.C.: HQDA, November 1988), pp. 5-13 to 5-15.

<sup>4</sup>U.S. Congress, Congressional Budget Office, Army Air Defense for Forward Areas: Strategies and Costs (Washington, D.C.: USGPO, June 1986), p. x.;

Robert J. Curran, The ADA Battalion in the Heavy Division - Can It Provide the Necessary Support? (Ft. Leavenworth, Kansas: U.S. Army School of Advanced Military Studies, 5 January 1985), p. 4.

<sup>5</sup>Ibid., p. 3.

<sup>6</sup>Donald S. Pihl, Lieutenant General, U.S. Army, and J. R. Sculley, Assistant Secretary of the Army (Research, Development, and Acquisition), Weapon Systems 1989: United States Army, (Washington, D.C.: USGPO, 1989), p. 55.

<sup>7</sup>Ibid.

<sup>8</sup>Ibid.

<sup>9</sup>William McManaway, Major (P), U.S. Army, Special Project Officer for Director, Combat Developments (DCD), USAADASCH, Ft. Bliss, Texas, in handwritten response dated 26 September 1989 to author's request for information on monograph prospectus,;

Also see Weapon Systems 1989, p. 55.

<sup>10</sup>John O. Marsh, Jr., and General Carl E. Vuono, The Posture of the United States Army - Fiscal Years 1990/1991 (Addendum dated 4 May 1989) (Washington, D.C.: Department of the Army, 1989), p. 3-4;

Tom Donnelly, "Branch Out On A Limb," Army Times, September 25, 1989, pp. 16-17.

<sup>11</sup>Caleb Baker, "Air Defense Blueprint: Upgrade Weapons," Army Times, September 4, 1989, p. 24.

<sup>12</sup>U.S. Army, TC 44-3 (Preliminary Draft) FAAD/SHORAD Battalion and Battery Employment, "How To Fight" (Washington, D.C.: HQDA, June 1988), pp. 3-15, 3-16.

<sup>13</sup>Ibid., p. 3-16.

<sup>14</sup>United States Congress, Congressional Budget Office, Army Air Defense For the Forward Areas: Strategies and Costs (Washington, D.C.: USGPO,



June 1986), p. 5;

See also FM 44-100, "The Changing Threat," p. 2-7 for related discussion.

<sup>15</sup>CBO, p.6.

<sup>16</sup>Flowers, Major, FACT SHEET: Stinger Under Armor, ATSA-TDT-S, USAADASCH, Ft. Bliss, Texas, 12 July 1985.

<sup>17</sup>FM 44-100, pg. 1-2, quoting: JCS Pub 3-01.2, Joint Doctrine For Theater Counterair Operations.

<sup>18</sup>FM 44-100, pp. 3-3.

<sup>19</sup>Ibid.

<sup>20</sup>Ibid., p. 3-4.

<sup>21</sup>Ibid., p. 1-2;

Also see TRADOC PAM 525-XX, US Army Operational Concept For Combined Arms Air Defense, April 1988, pp. 6-26 for a detailed discussion of Army contributions to Counterair Operations.

<sup>22</sup>FM 44-100, p. 1-3.

<sup>23</sup>U.S. Army, FM 44-1, U.S. Army Air Defense Artillery Employment (w/Change 1 dated 28 August 1984) (Washington, D.C.: HQDA, 1984), p. 1-10.

<sup>24</sup>FM 44-100, p. 3-8.

<sup>25</sup>FM 44-100, p. 3-9.

<sup>26</sup>USAADASCH, Briefing Slides Subject: Air Defense Modernization - A Major Army Challenge of the 1990s, presented to ADA members of CGSC Class of 1990, September 1989.

<sup>27</sup>U.S. Army, FM 44-16, Platoon Combat Operations - Chaparral, Vulcan, and Stinger (Washington, D.C.: HQDA, May 1987), pp. 1-9 to 1-10.

<sup>28</sup>Tony Cullen and Christopher F. Foss, ed., Jane's Battlefield Air Defence 1988-1989 (Surrey, U.K.: Jane's Information Group, 1988), pp. 64-66 for complete system description of Vulcan and all its variants.

<sup>29</sup>See Summary to CBO Report, pp. xi - xii.

<sup>30</sup>Curran, pp. 31-32.

<sup>31</sup>FM 44-16, p. 1-10.

<sup>32</sup>FM 44-3, p. 6-7.

<sup>33</sup>FM 44-3, pp. 6-4 to 6-7;

FM 44-1, p. 4-12.

<sup>34</sup>FM 44-1, p. 4-11;

U.S. Army, FM 44-3, Air Defense Artillery Employment Chaparral/Vulcan/Stinger (Washington, D.C., June 1984), p. 6-21.

<sup>35</sup>CBO, p. xi.

<sup>36</sup>Ibid., p. 2.

See also FM 44-3, Air Defense Artillery Employment Chaparral/Vulcan/Stinger, June 1984, pp. 1-5, 1-6 for further discussion on capabilities and limitations of SHORAD systems.

<sup>37</sup>Ibid. Many of these same factors are openly discussed in key ADA doctrinal publications such as FM 44-3 and FM 44-16.

<sup>38</sup>FM 44-1, pp. 4-21, B-6, B-7.

<sup>39</sup>FM 44-18, p. 5-5.

<sup>40</sup>Ibid.

<sup>41</sup>FM 44-3, p. 6-7.

<sup>42</sup>U.S. Army, FM 44-16, Platoon Combat Operations - Chaparral, Vulcan, and Stinger (Washington, D.C.: HQDA, May 1987), p. 3-16. This same warning is repeated in FM 44-3, p. 6-24.

<sup>43</sup>Peter W. Bradley, Colonel, Memorandum, Subject: Stinger Crew Survivability, from TSM-Shorad C2/Stinger to Director, DOES, USAADASCH, Ft. Bliss, Tx., 28 May 1985.

<sup>44</sup>Don Ingram, Colonel, USA, Director Tactics Department, USAADASCH, FACT SHEET: Stinger Employment in SGT York FOE I, Ft. Bliss, Texas, 5 February 1985.

<sup>45</sup>Ibid.

<sup>46</sup>Ibid.

<sup>47</sup>Charles W. Wood, LTC, Follow On Evaluation (FOE) I After Action Report, Tactical Lessons Learned Section, 25 July 1985, in author's personal possession.

<sup>48</sup>Commandant, Infantry School, Ft. Benning, Ga., Message to Commandant, USAADASCH, Ft. Bliss, Tx., Subject: Stinger Under Armor, Heavy Division, 211945Z May 1985.

<sup>49</sup>Wood, LTC, Follow-On Evaluation (FOE) I After Action Report, Appendix 3, Tactical Lessons Learned, pp. 19-21.

<sup>50</sup>Flowers, Major, Chief, SHORAD Branch, Tactics Department, USAADASCH, FACT SHEET Subject: Stinger Under Armor, dated 12 July 1985.

<sup>51</sup>Ibid.

<sup>52</sup>E.S. Leland, Brigadier General, USA, National Training Center Lessons Learned, Commanders Memorandum, 20 November 1985, p. 20.

<sup>53</sup>Ibid.

<sup>54</sup>CATA, NTC Lessons Learned Newsletter, Ft. Leavenworth, Kansas, 1 May 1986, p. 16., paragraph citation.

<sup>55</sup>Ibid., p. 17.

<sup>56</sup>CATA, NTC Lessons Learned News Letter, Ft. Leavenworth, Kansas, 1 September 1986, pp. 16-17.

<sup>57</sup>Ibid., p. 16.

<sup>58</sup>Ibid.

<sup>59</sup>Ibid., p. 17.

<sup>60</sup>CATA, NTC Lessons Learned, Ft. Leavenworth, Kansas, 27 February 1987, pp. 7-8.

<sup>61</sup>CATA, NTC Lessons Learned - Commander's Comments, The CS Team, Ft. Leavenworth, Kansas, 8 May 1987, pp. 10-12.

<sup>62</sup>Ibid., p. 10.

<sup>63</sup>Ibid., p. 11.

<sup>64</sup>Ibid., p. 12.

<sup>65</sup>HQ, USAADASCH, ATSA-CDE, Evaluation Plan (EP) for Vulcan/Stinger FDTE, 2 October 1986, p. 1.

<sup>66</sup>John H. Little, COL, AD, Summary Sheet with attached message to CDR, AMCCOM, Subject: MANPADS Modification Kit For Gun, Air Defense Artillery Self-Propelled, 20-mm, M163A1, dtd. 040720Z September 1986.

<sup>67</sup>Richard Trujillo, Captain, and Ed Foster, "Plans Jell For Stinger Under Armor," Air Defense Artillery, March-April 1988, pp. 22-24.

<sup>68</sup>HQ, USAADASCH, Air Defense Artillery Lessons Learned Bulletin Number 1-87, Ft. Bliss, Texas, February, 1987, pp. iii-iv, paragraph citation

except where noted.

<sup>69</sup>Ibid.

<sup>70</sup>Curran, p. 6.

<sup>71</sup>ADA Lessons Learned Bulletin 1-87, p. iii.

<sup>72</sup>George A. Latham, LTC, AD, Letter to Commandant, USAADASCH, Subject: Vulcan-Stinger Integration, undated.

<sup>73</sup>Ibid.

<sup>74</sup>Ibid.

<sup>75</sup>Ibid.

<sup>76</sup>James L. Smith, COL, AD, Memorandum to Director DOTD, Subject: Response to 2d Bn, 5th ADA Commander Concerning Stinger Under Armor, dated 9 April 1987.

<sup>77</sup>Ibid.

<sup>78</sup>Trujillo and Foster, pp. 22-24.

<sup>79</sup>CALL, Center For Army Lessons Learned Compendium, Volume 1, Heavy Forces, Ft. Leavenworth, Kansas, Fall 1988, p. 22., paragraph citation.

<sup>80</sup>Tantalous A. Smith, Captain, "Screaming Eagle ADA," Air Defense Artillery, November-December 1988, pp. 18-21.

<sup>81</sup>William L. Bond, LTC, USA, "Stinger APCs," Air Defense Artillery, September-October 1988, pp. 27.

<sup>82</sup>William L. Bond, LTC, "Stinger Initiatives," Air Defense Artillery, November-December 1988, pp. 22-23, paragraph citation.

<sup>83</sup>Elizabeth M. Carlson, "Battling 'Demons' at the NTC," Air Defense Artillery, Spring 1985, pp. 24-26.

<sup>84</sup>Steven Speakes, Major, USA, "The Brave Rifles at the NTC," Armor, May-June 1988, pp. 19-23.

<sup>85</sup>Ibid., p. 22.

<sup>86</sup>Steven W. Karaffa, Captain, and First Lieutenant Timothy J. Perez, "Air Defense in the Covering Force Area," Armor, July-August 1989, pp. 7-10.

<sup>87</sup>Karaffa, p. 10.

<sup>88</sup>Charles E. Kirkpatrick, Major, USA, Archie in the A.E.F. - The Creation of the Antiaircraft Service of the United States Army, 1917-1918 (Ft. Bliss, Texas: U.S. Army Air Defense Artillery School (USAADASCH), The Air Defense Artillery Museum, 1984), pp. 147-148.

<sup>89</sup>Ibid., p. 148.

<sup>90</sup>Kenneth P. Werrell, Archie, Flak, AAA, and SAM - A Short Operational History of Ground-Based Air Defense (Maxwell Air Force Base, Alabama: Air University Press), December 1988, p. xvi.

<sup>91</sup>Ibid., pp. 137-167.

<sup>92</sup>Werrell, pp. 57, 102, 127, 137, 140. See also the Forward by MG Donald R. Infante, Chief of Air Defense Artillery, for a summary of the same conclusion, p. xi.

<sup>93</sup>Robert H. Haseloff, "The Search for SAM," Air Defense Artillery, May-June 1989, pp. 20-24.

<sup>94</sup>Ibid.

<sup>95</sup>Blair Case, Editor in Chief, "Freedom to Maneuver," Air Defense Artillery, November-December 1988, back cover article.

<sup>96</sup>Ibid.

<sup>97</sup>Haseloff, pp. 21-22.

<sup>98</sup>U.S. Army, FM 100-2-3, The Soviet Army - Troops, Organization and Equipment, (Washington, D.C.: HQDA, 1984), p. 4-34.

<sup>99</sup>LTC Hamilton, M113 Program Manager, in phone conversation with author, 16 October 1989.

<sup>100</sup>Bill McManaway, Major (P), Special Assistant to Director, DCD, Ft. Bliss, Texas, in telephone conversation on 11 October 1989.

<sup>101</sup>USAADASCH, Briefing Slides, Subject: Afghanistan Lessons Learned, presented to CGSC ADA members of the Class of 1990, in September 1989, paragraph citation.

<sup>102</sup>Tom M. Schossau, Captain, USA, and 1st Lt. Randall Knapp, "Super Bowl for Light Divisions," Air Defense Artillery, May-June 1989, p. 13.

<sup>103</sup>Bradley.

<sup>104</sup>Cushman, p. 34.

<sup>105</sup>Ibid., pp. 34-35.

<sup>106</sup>Ibid., p. 35.

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